

ART. VIII.—*On Silver Wire Ligatures.* Read before the Brodie Med.-Chir. Society, Frederick City, Md., Dec. 1862. By REDFERN DAVIES, of Birmingham, England, now acting Assist. Surgeon, U. S. A.

IN the summer of 1858, being desirous of healing a vesico-vaginal fistula of very large size, I carried out exactly the operative measures advocated by Dr. Marion Sims. But whether from the size of the fistula, from defect in applying his silver clamps and wires, or from some bungling in the operation, I failed completely, although I was at the same time perfectly satisfied with the behaviour both of the clamps and wires.

Three years ago, having to treat a bad case of elephantiasis of the leg, I followed the means of cure first, I believe, both proposed and carried out by Dr. Carnochan. His plan of treatment consisted in cutting off the main arterial supply of blood to the limb, by tying the femoral artery at the apex of Scarpa's triangle. But deeming that I should effect the same result by tying the popliteal artery, and by reason of its being further removed from the trunk of the body, obviate some of the dangers attendant upon ligaturing the femoral, I tied the popliteal artery, and with a silver wire for a ligature. This came away on the twenty-first day, and the result of the operation was an almost complete diminution of the size of the limb to its natural dimensions.

I would particularly draw the attention of this meeting to this case, because it has been considered, both in New York and here, that though silver wire may be useful in tying arteries after amputations, it is not advisable to do so in their continuity. The best, most concise, and accurate description of the effects produced upon an artery by its ligation, that I know of, is in "Mr. Guthrie's Commentaries on the Surgery of the War." He says:—

"Where a round and small ligature is properly applied to an artery of a large size, such as the femoral, the sides of the vessel are brought together in a folded, plaited, or wrinkled manner; the ancient middle and inner coats of the artery, including the modern four, are divided, while the outer one remains entire and apparently unhurt.

"If the ligature be removed, an impression or indentation, made by it on the artery, will remain as a mark; and if the artery be slit open in a careful manner, the division of the inner coats will be obvious."

And again, he says:—

"The inner and middle coats formed by four distinct layers or structures, are not only divided, but the inner ones particularly seem to be curved inwards on themselves, so that the cut edge of one half or side is not applied to its fellow in the usual way of two surfaces, but by curving inward meets its opponent on every point of a circle, and in this way forms a barrier inside that of the external coat, which is tied around it by the ligature; so that in fact when a small ligature is firmly tied, its direct pressure is not applied to the inner coats, which

have been divided and curled away from it, but to the two layers of the outer coat which are in consequence of that pressure made to ulcerate or slough.

"The cut edges of the four inner layers being from this provision of nature perfectly free, are capable of taking on the process of inflammation which stops at the adhesive stage. This they do by the effusion of lymph or fibrin both within and without, to a greater or less extent as the case may require."

I have frequently tested the truthfulness of this description, by examining arteries, after they have been tied with silk, both upon dead and living subjects, and have had occasionally opportunities of doing so after a ligation has been made by a silver wire: the result of my observations has been, that their effects were identical, and that they corresponded with Guthrie's account.

On October 24, 1862, a patient of Dr. Porter's, upon whom I had tied the arteries with silver wire after an amputation of the leg four days previously, died. Within the posterior tibial artery, the only one I was enabled to examine, I found that for half an inch above the site of ligation the blood was firmly coagulated, the internal and middle coats of the artery were uniformly cut through, and that there was as completely organized a structure (as could be expected in so short a time) between and around them.

Allowing, then, that a ligature of silver wire acts as well as a silken one does, is any advantage to be ascribed to it? or is it a mere change of the material constituting the ligature?

I believe that there is a material advantage in a silver wire ligature over the usual silken one.

And that this advantage consists in the capability of silver wire for remaining in tissues nearly if not quite innocuous.

Thus, while the artery is undergoing its process of obliteration, a silver wire ligature does not of itself constitute a focus for purulent secretion, permeating tissues which we are endeavouring to unite by immediate adhesion, and these tissues temporarily weakened by their supply of blood being diminished.

Of the harmlessness resulting from silver wire remaining in living tissue, I have been for some time struck.

In a girl upon whom I operated for staphyloraphy, nearly four years ago, a silver wire still remains; it is the lowest one of three sutures that I inserted; at the time of the removal of the other two, not being satisfied with the union of the soft palate, I permitted it to remain, and was not allowed afterwards to remove it as it occasioned no inconvenience.

Just two years ago, I had operated on a case of vesico-vaginal fistula, by simply uniting the revived edges of the fistule with silver wire sutures. On the tenth day of their insertion I intended to remove them, but from an accident was unable to do so for three months, when I found the case perfectly cured.

In the *London Medical Times* (I think for July, 1859) I have recorded and illustrated by a woodcut of the parts implicated, a case in which I had attempted a radical cure of hernia on a woman. I had operated by the method described in *Druil's Surgery* as one suggested by me.

The patient on the eighth day after operation died from the consequences of intussusception of the bowel, on the opposite side to the one I had operated upon. The parts implicated in the operative procedure demonstrated well the perfect immunity from inflammatory process with which silver wire had perforated peritoneum even in three places.

In a case which I published in the *Lancet*, July, last year, and which is recopied in *Braithwaite's Retrospect of Med. and Surg.*, I say:—

“A patient, aged 17 years, was admitted into the Birmingham Work-house Infirmary on the 10th of December, 1858. He was the subject of varicocele on the left side, which had existed for three years, and to so great an extent as to prevent him from following his employment.

“Being desirous of radically curing him, I adopted the method of M. Ricord, which I had seen him perform with success, but instead of using the silken ligature which he used, I tried to do the same thing with silver wire, namely, between the vas deferens and the veins I passed, by means of a needle, a double wire; and by the same apertures in the opposite direction, anterior to all the veins, another wire. By engaging one free end through the loop of the other one on both sides, the veins were, by traction on the wire, compressed. This traction was kept up continuously by means of an elastic watch-spring bent in the shape of a horseshoe.

“In ten days' time, thinking the varicocele cured, and wishing to remove the wires, I tried to do so, and found I could not, though it was easy enough with the silken ligatures. I therefore cut off the wires as short as I could, trusting to the innocuity of silver wires to cause no harm. In another week the punctures were well healed, and he was discharged, the varicocele then appearing perfectly cured. Seeing him again in about a year's time, upon examination I found that all things remained as when he left; and he stated that he had resumed his work immediately upon leaving. He himself was totally unaware of there being any wires in his scrotum.”

But as a wire of silver is a foreign body to the tissues, it should therefore be treated as such, removed in general, and left alone when its removal is undesirable in any particular case.

In conclusion I would say, that when left temporarily in the soft parts—as a ligature or suture—I have observed that it creates a surprisingly *small amount* of irritation to them, and am very glad that the same fact has been similarly noticed and spoken of to me by those who have had the fullest opportunities of noticing the effects produced by silver wire ligatures in cases of amputation under their care.